Chemistry-4311
October 4, 2013

Quiz #4 **Name** Key

R = 8.314 J/mol-K = 0.08206 L-atm/mol-K = 1.987 cal/mol-K, $N_A = 6.02 \times 10^{23}$

1. Matching (Use a letter only once)

An increase in entropy corresponds to an (a) e in disorder.

The differential change in entropy dS is defined as a.

The Gibbs energy is defined as j.

The entropy change for boiling water is given by h.

For a spontaneous process at constant T,P and only P,V work, ΔG is − than zero.

a. dq_{rev}/T
b. greater
c. $\int C_P dT/T$
d. $C_p dT$
e. increase
f. less
g. $G = U - TS$
h. $\Delta S = \Delta H_{vap}/T$
i. decrease
j. $G = H - TS$

2. One mole of an ideal gas at 25 °C is expanded from 1 L to 10 L.

(a) Calculate q_{rev} for this process in J or kJ.

$\Delta U = q + w$

$\Delta U = 0$

$q = -w$

$w_{rev} = -nRT \ln V_2/V_1$

$q_{rev} = nRT \ln V_2/V_1$

$= 8.314 \times 298 \times \ln 10/1$

$= 5705\ J$

(b) Calculate ΔS for this process in J/K.

$\Delta S = \frac{q_{rev}}{T} = \frac{5705\ J}{298} = 19.14\ J/K$

3. The entropy of mixing of two gases is $\Delta S_{mix} = -R(n_A \ln x_A + n_B \ln x_B)$. Calculate ΔS_{mix} for mixing 3 moles of A with 5 moles of B. Give your answer in J/K.

$x_A = 3/8$, $x_B = 5/8$

$\Delta S_{mix} = -R(3 \ln 3/8 + 5 \ln 5/8)$; $R = 8.314\ J/K\text{-mol}$

$= 44.0\ J/K$